

FLUKE

TECHNICAL DATA

825A**VOLTMETER**

MODEL 825A PRECISION DIFFERENTIAL DC VOLTMETER



FEATURES

0.025% Accuracy

5 Microvolt Resolution

Infinite Input Resistance at Null
over entire 0 - 500 Volt Range

Standard Cell Reference

Polarity Switch

Taut-band Suspension Meter

In-Line Readout with Automatic
Lighted Decimal

No Zero Controls



Model 825A, the new FLUKE differential voltmeter, provides $\pm 0.025\%$ accuracy and infinite input resistance at null over the entire 500 volt range.

As additional features, the Model 825A includes a polarity switch which enables the operator to make negative or positive voltage measurements with equal convenience and a 0 - 25 MV recorder output which makes the Model 825A particularly useful for monitoring the stability of virtually any DC source.

Model 825A presents the value of the unknown voltage on an in-line five decade digital readout with automatic illuminated decimal. As another important feature, unique circuit design makes the Model 825A virtually impossible to damage by accidental overload.

The basic elements of the 825A are a standard cell used as an internal reference, a stable 500 volt reference source, a precision five-dial Kelvin-Varley voltage divider, and a chopper stabilized null detector. If required, the Model 825A may be supplied with a zener reference in place of the standard cell. To further increase versatility, the 825A is designed to be used with the FLUKE Model 80 Series Precision Voltage Dividers in order to accurately measure voltages to 30 KV.

As an example of the exceptional versatility of the Model 825A, a few of its many applications are explained below:

Calibration, testing and stability measurements of regulated power supplies.

Instrument calibration.

DC voltage measurements in high resistance circuits as well as low resistance sources including photocells, standard cells, computers, power supplies, batteries, tube circuits, thermocouples, storage devices, etc. All of these measurements may be made with accuracy and without source loading error.

As a substitute for conventional potentiometers, particularly for voltages above 1.6 v where the loading effect of voltage attenuators cannot be tolerated.

SPECIFICATIONS

AS A PRECISION POTENTIOMETER

INPUT VOLTAGE RANGE	*RECOMMENDED NULL SETTING	DIAL RESOLUTION	INPUT RESISTANCE PER VOLT OF INPUT VOLTAGE	
			AT NULL	1% OFF NULL
50-500	1-0-1	0.01 v	Infinite	1,000 Meg
5-50	0.1-0-0.1	0.001 v	Infinite	10,000 Meg
0.5-5	0.01-0-0.01	0.0001 v	Infinite	100,000 Meg
0-0.5	0.001-0-0.001	0.00001 v	Infinite	100,000 Meg

*Any null range may be used at any input voltage; recommended ranges are those most useful.

ACCURACY: $\pm 0.025\%$ of input voltage from 0.1 v to 500 v. $\pm 0.025\%$ of input voltage plus 25 microvolts, below 0.1 v.

These accuracies are obtained when recommended ranges are used.

AS A CONVENTIONAL VACUUM TUBE VOLTMETER

VOLTAGE RANGES	INPUT RESISTANCE	SCALE DEFLECTION
0 to ± 500 v	50 Meg.	500-0-500
0 to ± 50 v	50 Meg.	50-0-50
0 to ± 10 v*	10 Meg.	10-0-10
0 to ± 5 v	50 Meg.	5-0-5
0 to ± 1 v*	10 Meg.	1-0-1
0 to ± 0.5 v	50 Meg.	0.5-0-0.5
0 to ± 0.1 v*	10 Meg.	0.1-0-0.1
0 to ± 0.01 v*	10 Meg.	0.01-0-0.01
0 to ± 0.001 v*	1 Meg.	0.001-0-0.001

ACCURACY: 3% on all ranges. *These ranges obtained by setting NULL switch to desired sensitivity with the 5 voltage dials set to 0.

STABILITY OF REFERENCE SUPPLY: 0.01% for $\pm 10\%$ change in line voltage (105 v to 130 v). 0.01% per hour after warmup.

STABILITY OF METER ZERO: 1% of full scale for $\pm 10\%$ change in line voltage.

CALIBRATION: 500 volt reference supply calibrated against built-in standard cell.

INPUT POWER: 105 - 130 volts, 60 cps, 60 watts.

DIMENSIONS: 9-3/4" wide x 13" high x 14" deep, standard model. 19" wide x 7" high x 14" deep, rack mounting model.

FINISH AND WEIGHT: Smooth grey baked enamel. Grey baked wrinkle case. Cabinet model--25 lbs. Rack mounting model--22 lbs.

PRICE: Cabinet model--\$555.00; rack model--\$575.00. All prices f.o.b. factory, Mountlake Terrace, Washington.

The right is reserved, without notice, to make such changes in equipment, design, or components as engineering or manufacturing progress may warrant.

Prices subject to change without notice.

9-20-61

Litho in U.S.A.

Electronics FOR INDUSTRY



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MODEL 825A TEST PROCEDURE

NOTE: The OG3 reference tube must be aged for at least 150 hours before installation in the 825A.

TURN ONVISUAL INSPECTION

1. Check that PCB's and "ceramic type" switches have some sort of moisture treating.

Important: Mechanically zero meter.

2. Leakage Resistance - Measure resistance between negative binding post and chassis. Must be infinite as read on a Simpson meter. Set RANGE switch to 500V, NULL switch to VTVM, and K-V dials to 0, Polarity switch to +.
3. Input Power - Set power variac to 0 and turn instrument on. Slowly increase variac setting while monitoring input power. Increase variac setting to 117V. Input power should be 45-70W. Monitor input power while continuing preliminary checks and be alert for smoke or other evidence of trouble. Increase variac setting to 130V and check for any failure. Input power should not exceed 70W (or 75W for the 825A/G). Return variac to 117V for remaining checks.
4. Voltage Measurements (With Respect to Negative Binding Post as 117V Line) -
Reference Supply - High Voltage, Ebb, voltage at pins 7 and 9 of V102 should be 680-730V, dc.
5. 500V Reference - Voltage at pin 3 of V102 should be 470-530V, dc.

VTVM Supplies:

6. Voltage at pin 5 of V204 should be 140-168V.
7. Voltage across pins 4 and 5 of V202 should be 11.3 - 12.3V.
8. Bake - Operate instrument on normal line voltage for not less than 24 hours.

PRE-CALIBRATION CHECKS

NOTE: All measurements are with respect to negative binding post

unless otherwise stated and in the positive polarity. Start each check with normal line voltage (117V).

Reference Supply -

9. 500V Calibration - With the ADJ. CAL. pot in its center of rotation adjust R121 until reference is $500.0 \pm .2V$.
10. Reference voltage ripple, eo - Ripple voltage at V102 of pin 3 should not exceed 8 mv ac.
11. Reference Supply Regulation - Observe dc 500V reference voltage at V102 pin 3. Voltage must not change by more than 50 mv dc as line voltage is varied between 104-130V. At the same time observe the filament voltage on V102. Filament regulation should be .4V or less. Between high and low line the voltage should be between 5.5V and 6.6V.

Return line voltage to 117V and monitor voltage carefully for 30 seconds while lightly tapping instrument. Voltage must not change erratically.

Null Detector

12. +Eo Regulation - Observe voltage at V204 pin 5. Voltage must not change by more than 2V as line voltage is varied between 104 and 130V.
13. Ripple, +eo - Ripple voltage at V204 pin 5 should not exceed 15 mv.
14. Ef - Filament Regulation - Observe voltage across V202, pins 4 and 5. Supply must regulate within 200 mv as line is varied from 104-130V. Ripple should be less than 5 mv.
15. VTVM Zero Adjust - Check mechanical meter zero then place instrument in case. At 117V line with chassis ground connected to line ground, adjust R233 for a good null on the meter.
16. Rattle - Observe meter closely. Random excursions of meter needle should be less than 1/4 small division. Critical components - chopper, chopper drive unit (beat on meter), and cleanliness.
17. VTVM Offset Check - With K-V dialed to zero, turn NULL knob from VTVM to 10V - 1V - .1V - .01V - .001V. Meter should not deflect from null by more than 1/4 small division.

18. VTVM Zero Stability - With null switch in VTVM position, vary line from 104-130V. Meter needle must return to within 1/4 small division of its original reading.
19. VTVM Sensitivity - Turn NULL switch to VTVM position. Apply 500 volts to the instrument and adjust meter sensitivity. (R222) for full scale right deflection. Reverse the polarity of the 500V input and deflection to the left must be within 1/2 small division of full scale.
20. Meter Linearity - Apply voltages from 0 to 500V to the instrument in 100V steps. Meter must read accurately to within 3/4 small division at all times. Reverse polarity and repeat all readings.
21. Null Sensitivity Check - Set instrument to 500V Range, K-V to zero and short input. Turn null switch to 10V position and turn K-V "B" dial to 1, meter needle must deflect to within 1 small division of full scale.
22. Recorder Output Check - Measure mercury cell on .01 NULL range. Plug in an 801 or 801H into the recorder output. Turn K-V "C" dial of the unit under test and observe on the 801 (on .1V null) that the 801 meter follows the deviation on the instrument under test.
23. Polarity Reversal - Null out the voltage of the mercury cell on the .001V range. Reverse polarity - reading should be within 20 uv.
24. VTVM Leakage - Turn RANGE switch to 500V, NULL switch to .1V null sensitivity, and check meter zero with input posts open. Turn K-V "A" dial slowly to 4 and "B" dial slowly to 9. Meter offset must not exceed 2 small divisions.

Final Calibration

NOTE: Check mechanical and electrical zero.

25. Calibrate VTVM - This is mainly a cold check of the VTVM calibration.
26. Calibrate 500V - With instrument in the 500V range, dial up 499.910 on K-V, apply a voltage of $500 \pm .01V$. Next null out the 500V on the .1V null range by adjusting the external calibrate pot. While at null turn the Operate-Calibrate switch to Calibrate, then carefully adjust R318 to null on the meter.

27. Check 50V VTVM - Using the 525A - Put 50V into input and check accuracy of 50V VTVM position. Meter needle must deflect within $3/4$ small division.
28. Calibrate 49.9910. Null out 50V in the .01 null range by adjusting R323.
29. Check 5V - VTVM.
30. Calibrate 4.99910.
31. Check .5V - VTVM.
32. Calibrate .499910.
33. In the 500V Range, null out 100V on the .1V null range by dialing 100.00 and 99.910. Reading should be within ± 10 mv. (.01%)
34. In the 5V Range, null out 1V on the .001V null range. Reading should be within 140 uv. (.014%).
35. In the 5V Range, null out .25555 volts. Reading should be within 50 uv. (.020%).
36. In the .5V Range, null out .25555 volts. Reading should be within 40 uv. (.016%).
37. In the .5V Range measure .1V. Reading must be within 20 uv. (.020%).

825A TEST REPORT

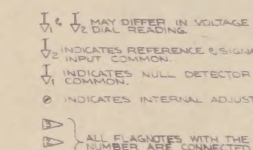
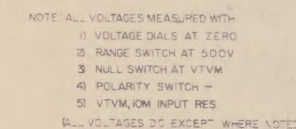
Serial Number: _____

Time & Date: _____

Tolerance

TURN ON		Tolerance		FINAL CALIBRATION		Date & Time			
						Test Limits		Hot	
						1-t 1 sd		Set to 0	
1. Visual Inspection (Chk meter zero)				25. 500V VTVM		20 mv hot		Set to 0	
2. Leakage Resistance				26. Cal 500V				*	
3. Input Power		45-60 w				40 mv cold		*	
4. Ebb, high voltage at 117V		680-730V		27. 50V VTVM		1-t 3/4 sd			
5. 500V reference		470-530V		28. Cal 49.9910V		±4 mv		Set to 0	
6. +Eo, VTVM		140-168V		29. 5V VTVM		1-t 3/4 sd			
7. Ef, VTVM Filaments		11.3-12.3V		30. Cal 4.99910V		±.4 mv		Set to 0	
8. Bake				31. .5V VTVM		1-t 3/4 sd			
PRE-CAL				32. Cal .499910V		±50 uv		Set to 0	
				33. 100.00V & 99.910V		±10 mv			
				34. 1.000V on 5V		±140 uv			
				35. .25500V on 5V		±50 uv			
9. 500V Calibration				36. .25500V on .5V		±40 uv			
10. eo, Reference ripple voltage		1-t 8 mv ac		37. .10000 on .5V		±20 uv			
11. Ref. stability at 104-130 (Chk 9-7)		1-t 50 mv *		38. Std. Cell/Reading		1.019		1.019	
12. +Eo, VTVM regulation 104-130		1-t 2V							

KV



B25A SER 185 TO 379
B25AR SER 144 TO 233

FUNCTIONAL SCHEMATIC

DIFFERENTIAL
VOLTMETER
MODEL B25A B I

JOHN FLUKE MANUFACTURING CO

